Kramer Electronics, Ltd.

USER MANUAL

Model:

TP-185

8 Channel UXGA/Audio/RS-232 to CAT 5 Transmitter

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1 Introduction

Welcome to Kramer Electronics! Since 1981, Kramer Electronics has been providing a world of unique, creative, and affordable solutions to the vast range of problems that confront the video, audio, presentation, and broadcasting professional on a daily basis. In recent years, we have redesigned and upgraded most of our line, making the best even better! Our 1,000-plus different models now appear in 11 groups[1] that are clearly defined by function.

Congratulations on purchasing your **TP-185,** *8 Channel UXGA/Audio/RS-232 to CAT 5 Transmitter*, which is ideal for the following typical applications:

- Transmission of video, audio and RS-232 signals for extended distances over standard STP/UTP cables
- Multimedia and presentation source and acceptor selection

The package includes the following items:

- **TP-185,** *8 Channel UXGA/Audio/RS-232 to CAT 5 Transmitter*
- Power cord[2], rack “ears” and this user manual[3]

2 Getting Started

We recommend that you:

- Unpack the equipment carefully and save the original box and packaging materials for possible future shipment
- Review the contents of this user manual
- Use Kramer high performance high-resolution cables[4]

1 GROUP 1: Distribution Amplifiers; GROUP 2: Switchers and Routers; GROUP 3: Control Systems; GROUP 4: Format/Standards Converters; GROUP 5: Range Extenders and Repeaters; GROUP 6: Specialty AV Products; GROUP 7: Scan Converters and Scalers; GROUP 8: Cables and Connectors; GROUP 9: Room Connectivity; GROUP 10: Accessories and Rack Adapters; GROUP 11: Sierra Products

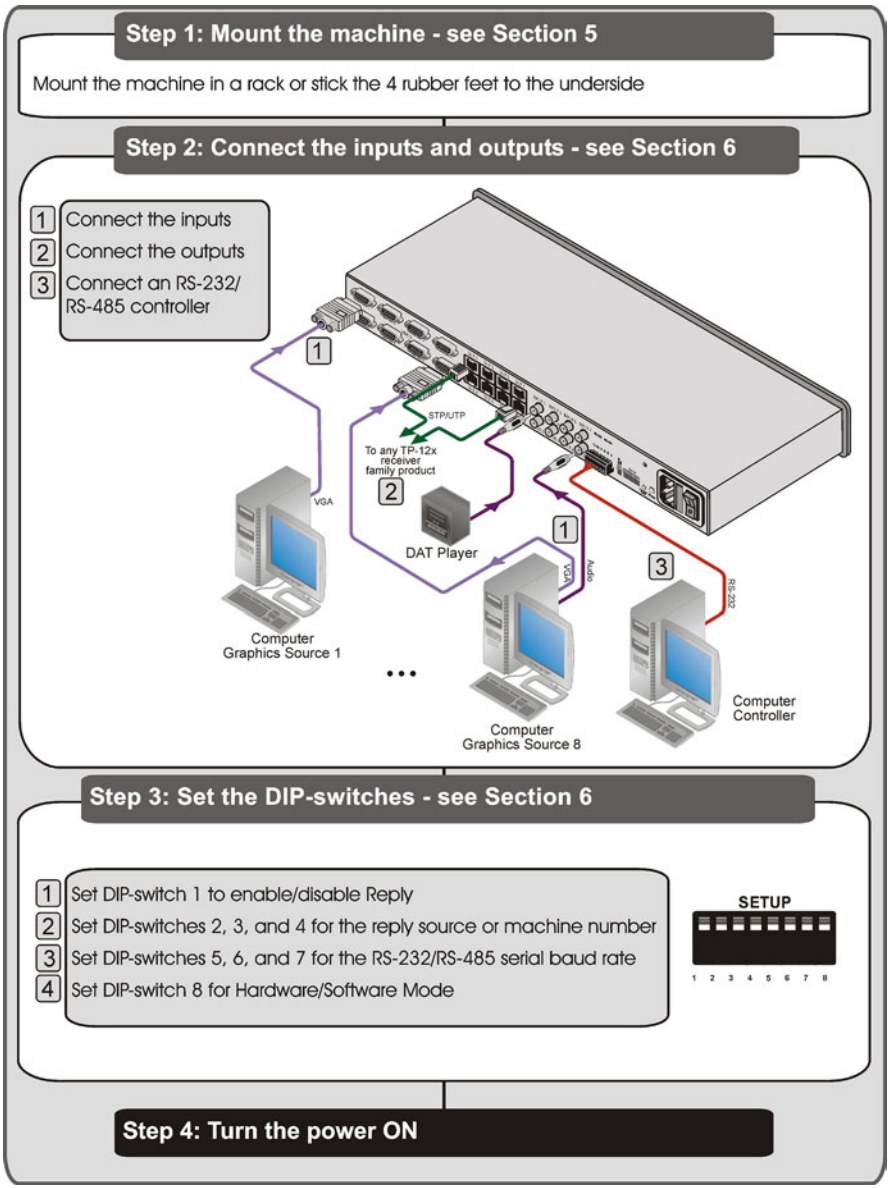
2 We recommend that you use only the power cord that is supplied with this machine

3 Download up-to-date Kramer user manuals from http://www.kramerelectronics.com

4 The complete list of Kramer cables is available from http://www.kramerelectronics.com

2.1 Quick Start

This quick start chart summarizes the basic setup and operation steps.



3 Overview

The **TP-185** is a high performance, 8 channel VGA/UXGA[1], audio and RS-232 to CAT 5 transmitter for high resolution video, stereo unbalanced audio and RS-232 signals. The CAT 5 outputs can be connected to any Kramer compatible TP receiver, for example, the **TP-126**. The **TP-185** can also route data from the RS-232 or RS-485 port to any of the CAT 5 outputs.

In particular, the **TP-185,** *8 Channel UXGA/Audio/RS-232 to CAT 5 Transmitter* features:

- Eight UXGA video inputs
- Eight stereo unbalanced audio inputs on 3.5mm mini jacks
- Eight RJ-45 STP/UTP outputs
- Transmission of RS232/RS-485 data from one input to any or all of the eight CAT 5 outputs, and one reply from the selected output

The **TP-185** can differentiate between RS-232/RS-485 commands that control the unit itself and commands that are destined for end-user equipment (see Section 7.1.5.2).

The **TP-185** is dependable, rugged, and fits into one vertical space (1U) of a standard 19" professional rack.

To achieve the best performance:

- Use only good quality connection cables[2] to avoid interference, deterioration in signal quality due to poor matching, and elevated noise levels (often associated with low quality cables)
- Do not secure the cables in tight bundles or roll the slack into tight coils
- Avoid interference from neighboring electrical appliances that may adversely influence signal quality, and position your Kramer **TP-185** away from moisture, excessive sunlight and dust

3.1 Shielded Twisted Pair/Unshielded Twisted Pair

We recommend that you use Shielded Twisted Pair (STP) cable. There are different levels of STP cable available, and we advise you to use the best quality STP cable that you can afford. Our non-skew-free cable, Kramer **BC-STP** is intended for analog signals where skewing is not an issue. For cases where there is skewing, our UTP skew-free cable Kramer **BC-XTP**, may be used. Bear in mind though, that we advise using STP cables where possible, since the compliance to electromagnetic interference was tested using those cables. Although Unshielded Twisted Pair (UTP) cable might be preferred for long range applications, the UTP cable should be installed far away from electric cables, motors and so on, which are prone to create electrical interference.
However, since the use of UTP cable might cause inconformity to electromagnetic standards, Kramer does not commit to meeting the standard with UTP cable.

1 Up to and including WUXGA 1920 x 1200 resolution

2 Available from Kramer Electronics on our Web site at http://www.kramerelectronics.com

4 Defining the TP-185 8 Channel UXGA/Audio/RS-232 to CAT 5 Transmitter

Figure 1 and Table 1 define the front and rear panels of the **TP-185,** *8 Channel UXGA/Audio/RS-232 to CAT 5 Transmitter*.

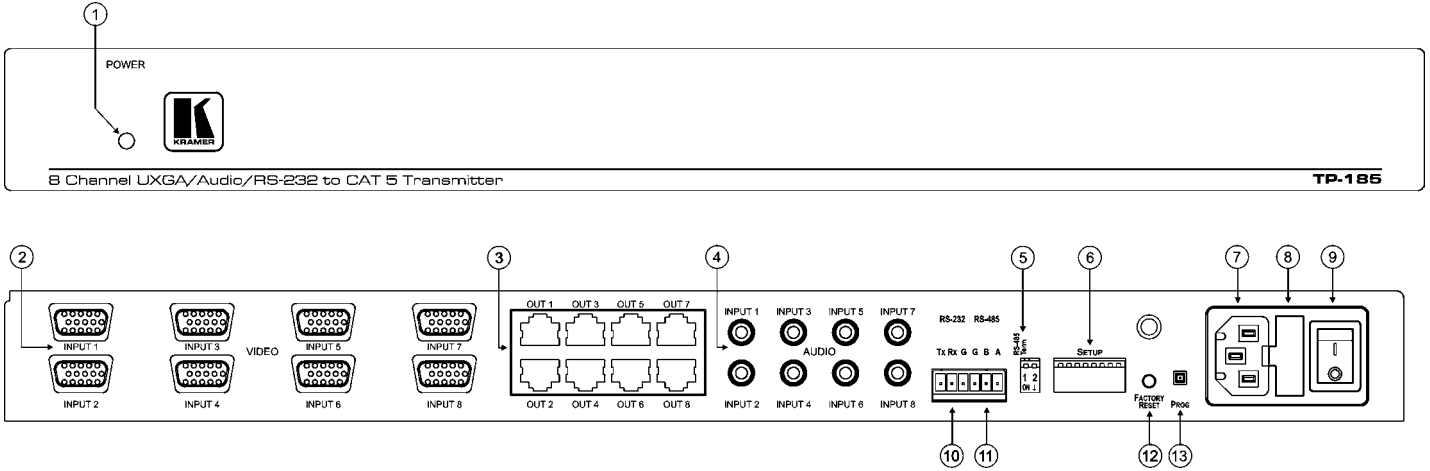


Figure 1: TP-185 Front and Rear Panels

Table 1: TP-185 Front and Rear Panel Features

#	Feature	Function	
1	*POWER* LED	Lights green when the unit is turned on[1]	
2	*VIDEO INPUT* 15-pin HD Connectors	Connect to the VGA/UXGA video sources (from 1 to 8)	
3	*OUT* STP/UTP RJ-45 Connectors	Connect to the TP receivers (from 1 to 8)	
4	*AUDIO INPUT* 3.5mm Mini Jacks	Connect to the unbalanced stereo audio sources (from 1 to 8)	
5	*RS-485 TERM* DIP-switch	Sets the termination of the RS-485 bus[2]: ON for RS-485 bus termination with 120Ω (default), OFF for no RS-485 bus termination (see Section 7.1.1)	
6	*SETUP* DIP-switch	Reply DIP-switch 1	Enables and disables the Reply feature (see Section 7.1.2)
		Address DIP-switches 2, 3 and 4	Determines the reply source (hardware mode) or machine number (software mode) see Section 7.1.3
		Baud Rate DIP-switches 5, 6 and 7	Determines the serial port baud rate (see Section 7.1.4)
		Hardware/Software DIP-switch 8	Determines whether the data transmission path is set by software or hardware (see Section 7.1.5)
7	AC Mains Connector	Connect to the AC mains power	
8	AC Mains Fuse	AC mains power fuse	
9	AC Mains Power Switch	Turns the unit power ON or OFF	
10	*RS-232* Terminal Block	Connect to a PC or remote controller (see Section 6.4)	
11	*RS-485* Terminal Block	Pins B (–) and A (+) are for RS-485; Pin G (Ground) may be connected to the shield of the cable if required (see Section 6.3)	
12	*FACTORY RESET* Button	Press and hold while powering up the unit to reset the data transmission setup to its factory default value[3] (see Section 10)	
13	*PROG* Button	For service use only	

1 See item 9

2 The first and the last units on the RS-485 line should be terminated (on). Other units should be unterminated (off), see Section 7.1.1

3 Turn the unit off using the power switch and then turn it on while pressing the Factory Reset button. The unit will power up and load its memory with the factory default definitions

5 Installing the TP-185 in a Rack

This section describes what to do before installing in a rack and how to rack mount the **TP-185**.

Before installing in a rack, be sure that the environment is within the recommended range:

OPERATING TEMPERATURE:	0º to +55ºC (32º to 131ºF)
STORAGE TEMPERATURE:	-45º to +72ºC (-49º to 162ºF)
HUMIDITY:	10% to 90%, RHL non-condensing

CAUTION!

When installing on a 19" rack, avoid hazards by taking care that:

1. It is located within the recommended environmental conditions, as the operating ambient temperature of a closed or multi unit rack assembly may exceed the room ambient temperature.

2. Once rack mounted, enough air will still flow around the machine.

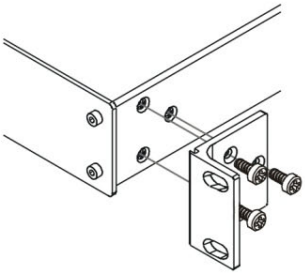
3. The machine is placed straight in the correct horizontal position.

4. You do not overload the circuit(s). When connecting the machine to the supply circuit, overloading the circuits might have a detrimental effect on overcurrent protection and supply wiring. Refer to the appropriate nameplate ratings for information. For example, for fuse replacement, see the value printed on the product label.

5. The machine is earthed (grounded) in a reliable way and is connected only to an electricity socket with grounding. Pay particular attention to situations where electricity is supplied indirectly (when the power cord is not plugged directly into the socket in the wall), for example, when using an extension cable or a power strip, and that you use only the power cord that is supplied with the machine.

To rack-mount a machine:

1. Attach both ear brackets to the machine. To do so, remove the screws from each side of the machine (3 on each side), and replace those screws through the ear brackets.



2. Place the ears of the machine against the rack rails, and insert the proper screws (not provided) through each of the four holes in the rack ears.

Note:

- In some models, the front panel may feature built-in rack ears
- Detachable rack ears can be removed for desktop use
- Always mount the machine in the rack before you attach any cables or connect the machine to the power
- If you are using a Kramer rack adapter kit (for a machine that is not 19"), see the Rack Adapters user manual for installation instructions available from our Web site

6 Connecting and Configuring the TP-185

This section comprises connecting:

- The **TP-185** (see Section 6.1)
- To the **TP-185** via RS-232 (see Section 6.2)
- To the **TP-185** via RS-485 (see Section 6.3)
- Multiple **TP-185** units via RS-485 (see Section 6.4)

6.1 Connecting the TP-185

To connect[1] the TP-185, as illustrated in the example[2] in Figure 2:

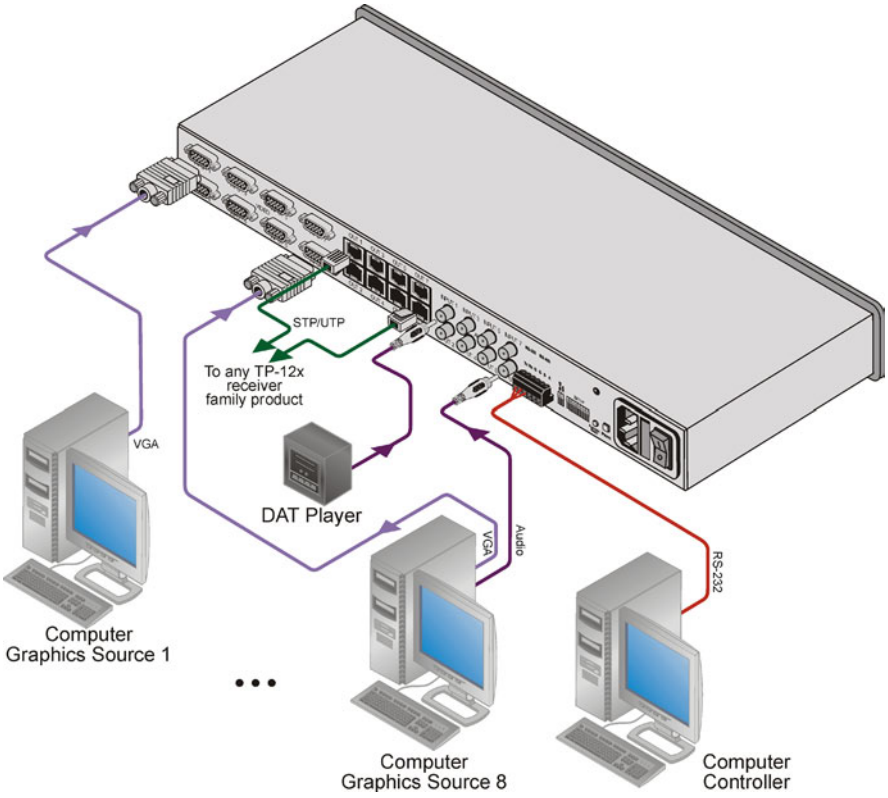


Figure 2: Connecting the TP-185, 8 Channel UXGA/Audio/RS-232 to CAT 5 Transmitter

1 You do not need to connect all inputs and outputs

2 Switch off the power on each device before connecting it to your TP-185. After connecting your TP-185, switch on its power and then switch on the power on each device. DO NOT push in the rear panel Flash Program PROG button , it is only used for upgrading to the latest Kramer firmware

1. Connect up to eight VGA/WUXGA computer graphics sources (for example, multimedia computers) to the Video INPUT 15-pin HD connectors.
2. Connect up to eight unbalanced stereo audio sources (for example, the audio source of the computer or a DAT player) to the eight AUDIO INPUT 3.5mm mini jacks.
3. Connect the eight OUT STP/UTP connectors to up to eight TP receivers.
4. If required, you can connect a PC and/or controller to the:
   - RS-232 terminal block (see Section 6.2)
   - RS-485 terminal block (see Section 6.3 and Section 6.4)
5. Connect the power cord[1] (not shown in Figure 2).

6.2 Connecting to the TP-185 via an RS-232 Connection

To connect the RS-232 port on the TP-185 to an RS-232 device:

1. Connect the RS-232 Tx pin on the **TP-185** to pin 2 (9-pin D-sub) on the RS-232 device
2. Connect the RS-232 Rx pin on the **TP-185** to pin 3 (9-pin D-sub) on the RS-232 device
3. Connect the RS-232 G pin on the **TP-185** to pin 5 (9-pin D-sub) on the RS-232 device

6.3 Connecting to the TP-185 via an RS-485 Connection

You can operate the **TP-185** via the RS-485 port from a distance of up to 1200m (3900ft) using a PC equipped with a card that provides an RS-485 port.

To connect a PC or controller to the RS-485 port on the unit:

1. Connect the pins on the following ports:
   - Connect the A(+) pin on the RS-485 port of the PC to the A pin on the RS-485 port on the rear panel of the **TP-185**
   - Connect the B(–) pin on the RS-485 port of the PC to the B pin on the RS-485 port on the rear panel of the **TP-185**
   - If required, connect the GND pin[2] on the RS-485 port of the PC to the G (ground) pin on the rear panel of the **TP-185**
2. If this is the only **TP-185** on the RS-485 bus, set the RS-485 TERM DIP-switch (see Section 7.1.1) to ON (for RS-485 line termination with 120Ω).

1 We recommend that you use only the power cord that is supplied with this machine

2 For RS-485 communication, the ground is usually not connected between the devices. When using a shielded cable, the shield may be grounded on one side

6.4 Connecting Multiple TP-185 Units via the RS-485 Bus

You can connect up to 8 **TP-185** units via the RS-485 bus with control from a PC or serial controller.

To connect up to 8 TP-185 units via RS-485 (see Figure 3):

1. Connect the RS-485 terminal block of the first **TP-185** to the RS-485 terminal block of the second **TP-185**, and so on (see Section 6.3), connecting all the **TP-185** units via the RS-485 terminal blocks.
2. Set each **TP-185** Machine number to be a unique number (see Section 7.1.3).
3. On the first and last **TP-185** physical devices on the RS-485 bus, set the RS-485 TERM DIP-switch ON (terminating the RS-485 line at 120Ω, see Section 7.1.1).
4. On all other **TP-185** units, ensure that the RS-485 Term DIP-switch is OFF.

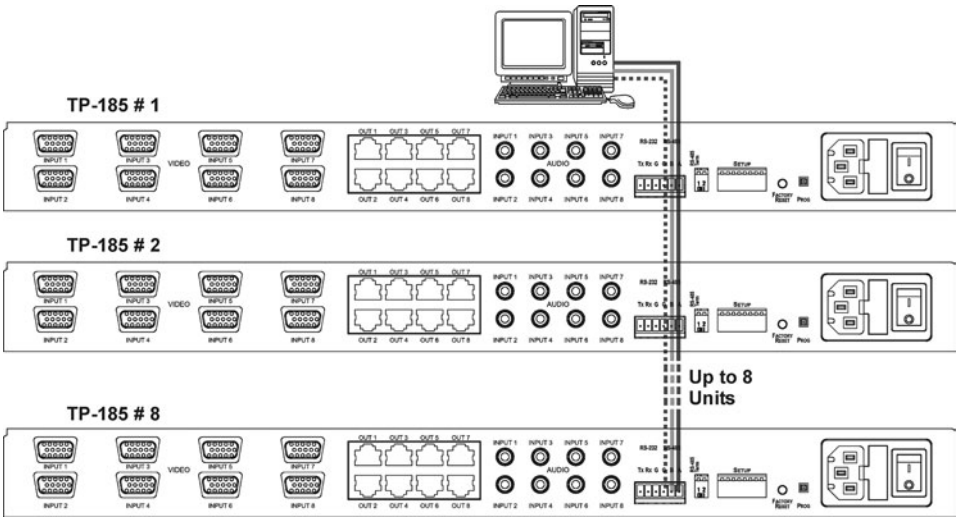


Figure 3: Connecting Multiple TP-185 Units via RS-485

7 Setting the DIP-switches on the TP-185

The DIP-switches on the **TP-185** perform the following functions:

- RS-485 termination
- Reply enable/disable
- Reply machine number
- Baud rate
- Hardware/software mode

Moving a DIP-switch down turns the switch on, moving it up turns the switch off.

Note: Changing any DIP-switch requires that you cycle power on the **TP-185**

7.1.1 Setting the RS-485 Bus Termination

The DIP-switch sets the RS-485 bus termination. Only the first and last physical device on the RS-485 bus must be terminated, all other devices must be un-terminated.

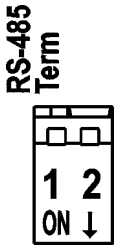


Figure 4: TP-185 DIP-switch RS-485 Termination

When DIP-switch 1 is:

- OFF, the unit is un-terminated (default)
- ON, the unit is terminated

Note: DIP-switch 2 is not used.

7.1.2 Enabling and Disabling the Reply Feature

DIP-switch 1 enables and disables the Reply feature.

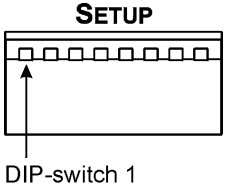


Figure 5: TP-185 Reply Enable and Disable DIP-switch

When DIP-switch 1 is:

- Up, Reply is disabled (default)
- Down (ON), Reply is enabled

7.1.3 Setting the Reply Source or Machine Number

DIP-switches 2, 3 and 4 set either the reply source (in Hardware mode Table 2) or machine number (in Software mode Table 3).

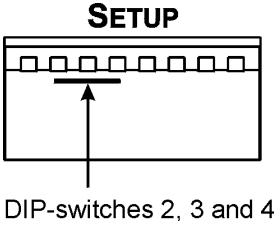


Figure 6: TP-185 Reply Source or Machine Number DIP-switches

Table 2: Hardware Mode Reply Source DIP-switch Setting

Reply Source	DIP-switch		
	2	3	4
Reply is taken from output 1 (default)	OFF	OFF	OFF
Reply is taken from output 2	ON	OFF	OFF
Reply is taken from output 3	OFF	ON	OFF
Reply is taken from output 4	ON	ON	OFF
Reply is taken from output 5	OFF	OFF	ON
Reply is taken from output 6	ON	OFF	ON
Reply is taken from output 7	OFF	ON	ON
Reply is taken from output 8	ON	ON	ON

Note: When there is more than one **TP-185** attached to the RS-485 bus only one unit can have a reply path set.

Table 3: Software Mode RS-485 Machine Number DIP-switch Setting

Machine Number	DIP-switch		
	2	3	4
1	OFF	OFF	OFF
2	ON	OFF	OFF
3	OFF	ON	OFF
4	ON	ON	OFF

Machine Number	DIP-switch		
	2	3	4
5	OFF	OFF	ON
6	ON	OFF	ON
7	OFF	ON	ON
8	ON	ON	ON

When there is more than one **TP-185** attached to the RS-485 bus each unit must have a unique machine number.

7.1.4 Setting the RS-232/RS-485 Baud Rate DIP-switches

DIP-switches 5, 6 and 7 set the serial port baud rate in both Hardware and Software modes according to Table 4.

Note: In a multiple device configuration, all devices must be set to the same baud rate.

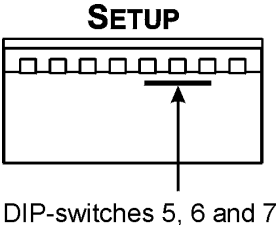


Figure 7: TP-185 Baud Rate DIP-switches

Table 4: Serial Port Baud Rate DIP-switch Setting

Baud Rate	DIP-switch		
	5	6	7
1200	OFF	OFF	OFF
2400	ON	OFF	OFF
4800	OFF	ON	OFF
9600 (default)	ON	ON	OFF

Baud Rate	DIP-switch		
	5	6	7
19200	OFF	OFF	ON
38400	ON	OFF	ON
57600	OFF	ON	ON
115200	ON	ON	ON

7.1.5 Selecting Hardware/Software Mode

DIP-switch 8 sets the operating mode to either Hardware or Software mode.

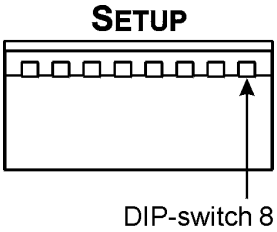


Figure 8: TP-185 Baud Rate Hardware/Software DIP-switch

When the DIP-switch is:

- OFF, the unit is set to Hardware mode (default)
- ON, the unit is set to Software mode

7.1.5.1 Hardware Mode

In Hardware mode, the:

- RS-232 data is passed from any input to all outputs
- **TP-185** routes the reply from the output port defined by the DIP-switches 2, 3 and 4 (see Section 7.1.2). For reliable operation, only one port can be defined

7.1.5.2 Software Mode

In Software mode, the **TP-185** routes the data and reply based on the Protocol 2000 commands received from the PC or other device connected to any of the inputs.

The following example illustrates a typical command sequence. The destination and return paths to and from the end-user device are set (**TP-185** control commands), then an end-user device command is sent to the defined destination. The **TP-185** differentiates between the two types of commands and acts accordingly.

The sequence is as follows:

1. Set destination path for command
2. Set return path
3. Send end-user command sequence

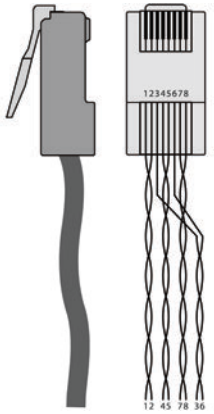
8 Wiring the Twisted Pair RJ-45 Connectors

Table 5 and Figure 9 define the TP pinout using a straight pin-to-pin cable with RJ-45 connectors. When using STP cable, connect/solder the cable shield to the RJ-45 connector shield.

Table 5: UTP Connector Pinout

EIA /TIA 568B	
PIN	**Wire Color**
1	Orange / White
2	Orange
3	Green / White
4	Blue
5	Blue / White
6	Green
7	Brown / White
8	Brown
Pair 1	4 and 5
Pair 2	1 and 2
Pair 3	3 and 6
Pair 4	7 and 8

Figure 9: CAT 5 Pinout



9 Technical Specifications

Technical specifications of the **TP-185** are shown in Table 6.

Table 6: Technical Specifications[1] of the TP-185

INPUTS:	8 UXGA on 15-pin HD connectors (VGA through WUXGA) 8 unbalanced stereo audio 3.5mm mini jacks	
OUTPUTS:	8 TP on RJ-45 connectors	
RESOLUTION:	Up to WUXGA (1920 x 1200)	
RANGE:	Up to 100m (328ft)	
MAX. OUTPUT LEVEL:	VIDEO: 1.6Vpp	AUDIO: 2.3Vpp
CONTROLS:	RS-232 3 pin terminal block RS-485 3 pin terminal block	
SERIAL BAUD RATE:	Up to 19200kbps	
SERIAL MODE:	Full-duplex	
BANDWIDTH:	AUDIO: 20Hz to 20kHz @0.5dB	
S/N RATIO:	AUDIO: <-80dB	
TOTAL GAIN:	Audio: 0dB	
COUPLING:	Audio: AC	
AUDIO THD + NOISE:	Audio: <0.03%	
POWER CONSUMPTION:	100-240V AC, 16VA	
OPERATING TEMPERATURE:	0° to +55°C (32° to 131°F)	
STORAGE TEMPERATURE:	–45° to +72°C (–49° to 162°F)	
HUMIDITY:	10% to 90%, RHL non-condensing	
DIMENSIONS:	48.26cm x 19.1cm x 1U (19" x 7.52" x 1U) W, D, H	
WEIGHT:	3.8kg (8.4lbs) approx	
ACCESSORIES:	Power cord, Windows®-based control software, rack “ears”	

10 Default Communication Parameters

Table 7 lists the **TP-185** default communication parameters.

Table 7: TP-185 Communication Parameters

RS-232	
Protocol 2000	
Baud Rate:	9600
Data Bits:	8
Stop Bits:	1
Parity:	None
Command Format:	HEX
Example (Output 1 to Input 1):	0x01, 0x81, 0x81, 0x81

1 Specifications are subject to change without notice

10.1 Kramer Communication Protocol 2000

The RS-232/RS-485 Protocol 2000 uses four bytes of information as shown in Table 8. The data rate is set by the DIP-switches (see Table 4), with no parity, 8 data bits and 1 stop bit.

Table 8: Protocol Command Definition

	MSB							LSB
		DESTI-NATION	INSTRUCTION					
	0	D	N5	N4	N3	N2	N1	N0
	7	6	5	4	3	2	1	0
1st byte								
		INPUT						
	1	I6	I5	I4	I3	I2	I1	I0
	7	6	5	4	3	2	1	0
2nd byte								
		OUTPUT						
	1	O6	O5	O4	O3	O2	O1	O0
	7	6	5	4	3	2	1	0
3rd byte								
				MACHINE NUMBER				
	1	OVR	X	M4	M3	M2	M1	M0
	7	6	5	4	3	2	1	0
4th byte								

1st BYTE: Bit 7 – Defined as 0.
D – "DESTINATION": 0 - for sending information to the switchers (from the PC);
1 - for sending to the PC (from the switcher).
N5…N0 – "INSTRUCTION"
The function that is to be performed by the switcher(s) is defined by the INSTRUCTION (6 bits). Similarly, if a function is performed via the machine's keyboard, then these bits are set with the INSTRUCTION NO., which was performed. The instruction codes are defined according to the table below (INSTRUCTION NO. is the value to be set for N5…N0).

2nd BYTE: Bit 7 – Defined as 1.
I6…I0 – "INPUT".
When switching (ie. instruction codes 1 and 2), the INPUT (7 bits) is set as the input number which is to be switched. Similarly, if switching is done via the machine's front-panel, then these bits are set with the INPUT NUMBER which was switched. For other operations, these bits are defined according to the table.

3rd BYTE: Bit 7 – Defined as 1.
O6…O0 – "OUTPUT".
When switching (ie. instruction codes 1 and 2), the OUTPUT (7 bits) is set as the output number which is to be switched. Similarly, if switching is done via the machine's front-panel, then these bits are set with the OUTPUT NUMBER which was switched. For other operations, these bits are defined according to the table.

4th BYTE: Bit 7 – Defined as 1.
Bit 5 – Don't care.
OVR – Machine number override.
M4…M0 – MACHINE NUMBER.
Used to address machines in a system via their machine numbers. When several machines are controlled from a single serial port, they are usually configured together with each machine having an individual machine number. If the OVR bit is set, then all machine numbers will accept (implement) the command, and the addressed machine will reply.
For a single machine controlled via the serial port, always set M4…M0 = 1, and make sure that the machine itself is configured as MACHINE NUMBER = 1.

Table 9: Instruction Codes for the TP-185

INSTRUCTION		DEFINITION FOR SPECIFIC INSTRUCTION		NOTE
#	DESCRIPTION	INPUT	OUTPUT	
2C	CONTROLS THE STATUS OF A PORT	0–close 1–open	Output bit: O0–O5 = output # or 0 for all outputs O6–0 = Tx; 1 = Rx	1, 2, 4, 5
2D	READS THE STATUS OF A PORT	0–open	Output bit: O0–O5 = output # O6–0 = Tx; 1 = Rx	2, 3, 4, 5

Note: All values in the table are hexadecimal, unless otherwise stated.

NOTES on Table 9:

NOTE 1 – When the PC sends this command, if the instruction is valid the unit replies by sending the PC the same 4 bytes that it was sent (except for the first byte where the Destination bit is set high).

NOTE 2 – If O6 = 0 (Tx) – This command defines/reads the definition of the output # (1, 2 or3) to pass the RS-232/Direct command from any input. In this case the instruction does not modify previously set output numbers, allowing the setting of multiple outputs for the Direct command. If O6 = 1 (Rx), the command defines/reads the definition of the output # (1, 2 or 3) to pass the reply from the output to inputs. In this case, the instruction resets a previously set output number, preventing the setting of multiple outputs for the reply.

NOTE 3 – The reply to this command is as follows: The same command and output codes as were sent are returned, and the input is assigned the value of the parameter that was read. The reply is per the definitions in command 44.

NOTE 4 – At initial power-on or on reception of command 44 or 45, any received bytes are analyzed to see whether it is a command 44 or 45. If not, it is transmitted to the output based on the existing setup. If the analyzed bytes are a command 44 or 45, the unit waits for the other 3 bytes and interprets them as a Protocol 2000 command. The command is executed if relevant to this machine number or discarded if not.

NOTE 5 – This command works only when the unit is configured for Software mode.

Table 10: Sample TP-185 Control Commands

Command	Description	Reply
2C 80 80 81	Close all output ports for direct command	6C 80 80 81
2C 80 C0 81	Close all output ports for reply command	6C 80 C0 81
2C 81 82 81	Open port 2 for direct command	6C 81 82 81
2C 81 C1 81	Open port 1 for reply command	6C 81 C1 81
2D 80 81 81	Check status of port 1 for direct command. Port is closed	6D 80 81 81
2D 80 82 81	Check status of port 2 for direct command. Port is open	6D 81 82 81
2D 80 C1 81	Check status of port 1 for reply command. Port is open	6D 81 C1 81
2D 80 C2 81	Check status of port 2 for reply command. Port is closed	6D 80 C2 81

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We welcome your questions, comments, and feedback.

Caution

Safety Warning:
Disconnect the unit from the power supply before opening/servicing.

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